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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,727	03/16/2004	Atsushi Hirota	118925	1036

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EXAMINER	
FIDLER, SHELBY LEE	
ART UNIT	**PAPER NUMBER**
2861	

MAIL DATE	DELIVERY MODE
07/22/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,727	HIROTA, ATSUSHI	
	Examiner	Art Unit	
	SHELBY FIDLER	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 15-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 15-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Responsive Office Action

This Office Action is responsive to the remarks and amendments filed 4/3/2008.

Claim Objections

Claims 5 and 18 are objected to as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This claim attempts to further limit "the outermost one of the individual electrodes with respect to the arrangement direction." However, because parent claim 1 introduces the outermost individual electrode with respect to two arrangement directions, Examiner is unsure to which of those directions this limitation in claim 5 refers. For the purpose of examination, Examiner assumes that these limitations should read "the outermost one with respect to the two arrangement directions of the plurality of individual electrodes."

Claim 6 is objected to because of the following informalities: please change "a plurality of dummy electrodes" (line 7 of the claim) to "a plurality of the dummy electrodes" so that this limitation is given proper antecedent basis.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

> invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6695439 B2) in view of Takeuchi et al. (US 5512793).

Regarding claim 1:

Takahashi discloses an ink-jet head comprising:

a passage unit (ink chamber unit 20) in which a plurality of pressure chambers (ink chambers 24) each connected to a corresponding nozzle (col. 7, lines 32-37) are arranged adjacent to each other along a plane (Fig. 1); and

an actuator unit (piezoelectric transducer 10) that is fixed to the passage unit (Fig. 1) to change the volume of the pressure chambers (col. 9, lines 47-65),

wherein the actuator unit includes:

a piezoelectric element (piezoelectric plate 11) that spans a plurality of pressure chambers (Fig. 1), and

a plurality of individual electrodes (second driving electrodes 13) that have been sintered on a surface of the piezoelectric element at positions corresponding to the respective pressure chambers (col. 7, lines 58-60 & Fig. 1),

the plurality of individual electrodes includes an outermost one of the individual electrodes with respect to two arrangement directions of the plurality of individual electrodes.

Takahashi does not expressly disclose that the actuator unit includes:

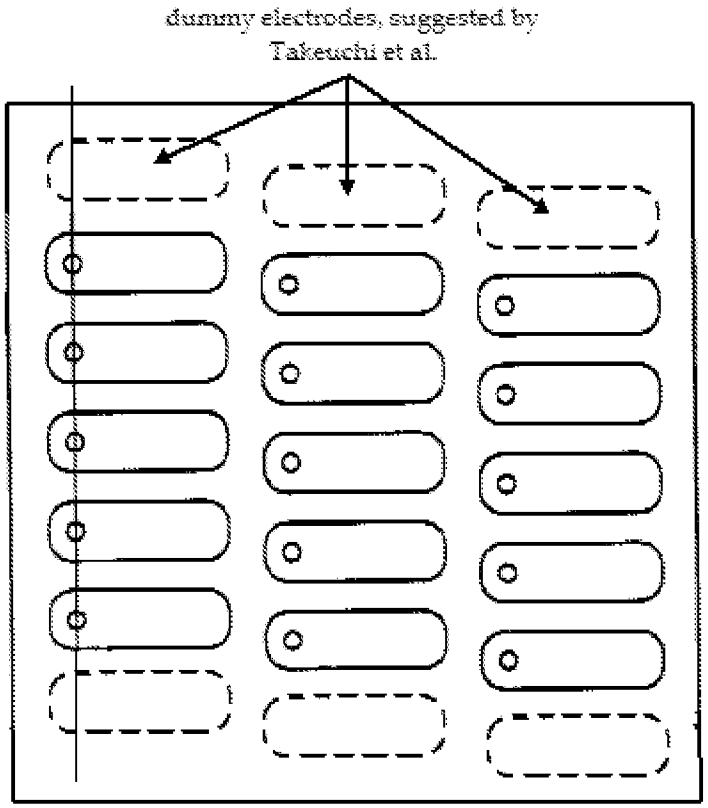
one or more dummy electrodes of the same residual stress characteristics as the individual electrodes at positions other than positions corresponding to the pressure

chambers and that are, on the surface of the piezoelectric element provided with the plurality of individual electrodes, spaced from an outermost one of the individual electrodes with respect to two arrangement directions of the plurality of individual electrodes, in an outward direction from the plurality of individual electrodes.

However, Takeuchi et al. disclose an ink-jet head comprising:

one or more dummy electrodes (electrodes 76 of displacement adjusting layers 60) of the same residual stress characteristics as individual electrodes (inherent to the identical construction disclosed in col. 10, lines 2-19) at positions other than positions corresponding to active pressure chambers (Fig. 2), and that are, on the surface of a piezoelectric element provided with the plurality of individual electrodes, spaced from the outermost one of the individual electrodes in an outward direction from the plurality of individual electrodes (Fig. 2). Takeuchi et al. suggest that, by utilizing displacement adjusting layers, the rigidity of the piezoelectric surface will be altered so as to make the amount of deformation of all active pressure chambers more uniform (col. 9, lines 56-63).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Takahashi's actuator unit to include dummy electrodes spaced in an outward direction from the individual electrodes, such that one of the dummy electrodes is spaced from Takahashi's outermost individual electrode with respect to two arrangement directions of the plurality of individual electrodes (see Drawing A below).



Drawing A: This drawing shows the suggested modification of Takahashi's actuator unit, in view of Takeuchi et al.'s teachings, by utilizing displacement adjusting layers in the form of dummy electrodes and dummy pressure chambers (taken from Figure 4 of Takahashi, and modified for clarification of rejection).

Regarding claims 2 and 16:

Takahashi as modified by Takeuchi et al. discloses all the limitations of claims 1/15, and **Takeuchi et al. also suggest** that the dummy electrodes and the individual electrodes have substantially the same residual stress characteristics relative to the piezoelectric element (col. 10, lines 2-19).

Regarding claims 3 and 17:

Takahashi as modified by Takeuchi et al. discloses all the limitations of claims 1/15, and **Takeuchi et al. also suggest** that the dummy electrodes and the individual electrodes are made of the same material (col. 10, lines 2-19).

Regarding claim 4:

Takahashi as modified by Takeuchi et al. discloses all the limitations of claim 3, and **Takeuchi et al. also suggest** that the dummy electrodes and the individual electrodes have substantially the same shape and same size (col. 10, lines 2-19).

Regarding claims 5 and 18 (as best understood):

Takahashi as modified by Takeuchi et al. discloses all the limitations of claims 1/15, and **the combination of Takahashi as modified by Takeuchi et al. also suggest** that each of the individual electrodes, other than the outermost one with respect to one of the two arrangement directions, is surrounded with corresponding ones of the individual electrodes arranged in a predetermined pattern (Drawing A); and

wherein the outermost one of the individual electrodes with respect to the two arrangement directions of the plurality of individual electrodes is surrounded with a corresponding one of the individual electrodes and a corresponding one of the dummy electrodes arranged in substantially the same pattern as the predetermined pattern (Drawing A).

Regarding claims 6 and 19:

Takahashi as modified by Takeuchi et al. discloses all the limitations of claims 1/15, and **Takahashi also disclose** that the plurality of pressure chambers are arranged adjacent to each other in a matrix on the plane of the passage unit (Fig. 4);

the plurality of individual electrodes (13) are arranged adjacent to each other in a matrix on the surface of the piezoelectric element at positions corresponding to the respective pressure chambers (Figs. 1 and 4); and

the combination of Takahashi as modified by Takeuchi et al. also disclose that a plurality of the dummy electrodes are arranged adjacent to each other so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix (Drawing A).

Regarding claims 7 and 20:

Takahashi as modified by Takeuchi et al. discloses all the limitations of claims 1/15, and **Takahashi also disclose** that the actuator unit also includes a common electrode (first electrode 12) that is formed, on a surface of the piezoelectric element opposite to the surface provided with the individual electrodes (Fig. 1), to span the plurality of pressure chambers (Fig. 1).

Regarding claim 15:

Takahashi discloses an ink-jet head comprising:

a passage unit (ink chamber unit 20) in which a plurality of pressure chambers (ink chambers 24) each connected to a corresponding nozzle (col. 7, lines 32-37) are arranged adjacent to each other along a plane (Fig. 1); and

an actuator unit (piezoelectric transducer 10) that is fixed to the passage unit (Fig. 1) to change the volume of the pressure chambers (col. 9, lines 47-65),

wherein the actuator unit includes:

a piezoelectric element (piezoelectric plate 11) that spans a plurality of pressure chambers (Fig. 1), and

a plurality of individual electrodes (second driving electrodes 13) that have been sintered on a surface of the piezoelectric element at positions corresponding to the respective pressure chambers (col. 7, lines 58-60 & Fig. 1),

the plurality of individual electrodes includes an outermost one of the individual electrodes with respect to two arrangement directions of the plurality of individual electrodes.

Takahashi does not expressly disclose that the actuator unit includes one or more sintered dummy electrodes at positions other than positions corresponding to the pressure chambers and that are, on the surface of the piezoelectric element provided with the plurality of individual electrodes, spaced from the outermost one of the individual electrodes with respect to two arrangement directions of the plurality of individual electrodes, in an outward direction from the plurality of individual electrodes, and

wherein the sintered dummy electrodes and the individual electrodes have substantially the same shape and the same size.

However, Takeuchi et al. disclose an ink-jet head comprising:

one or more dummy electrodes (electrodes 76 of displacement adjusting layers 60) of the same residual stress characteristics as individual electrodes (inherent to the identical construction disclosed in col. 10, lines 2-19) at positions other than positions corresponding to active pressure chambers (Fig. 2), and that are, on the surface of a

piezoelectric element provided with the plurality of individual electrodes, spaced from an outermost one of the individual electrodes in an outward direction from the plurality of individual electrodes (Fig. 2), and wherein the sintered dummy electrodes and the individual electrodes have substantially the same shape and the same size (col. 10, lines 2-19). Takeuchi et al. suggest that, by utilizing displacement adjusting layers, the rigidity of the piezoelectric surface will be altered so as to make the amount of deformation of all active pressure chambers more uniform (col. 9, lines 56-63).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Takahashi's actuator unit to include sintered dummy electrodes spaced in an outward direction from the individual electrodes, such that one of the sintered dummy electrodes is spaced from Takahashi's outermost individual electrode with respect to two arrangement directions of the plurality of individual electrodes (see Drawing A above).

Regarding claims 22 and 24:

Takahashi as modified by Takeuchi et al. discloses all the limitations of claims 1/15, and **Takahashi also discloses** that the two arrangement directions are formed in intersecting planes (Fig. 4).

Claims 8 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 526964) in view of Sakaida (US 6174051 B1).

Regarding claim 8:

Takahashi et al. disclose an ink-jet head comprising:

a passage unit (channel 34) in which a plurality of pressure chambers (ink channels 32) each connected to a corresponding nozzle (col. 4, lines 51-58) are arranged adjacent to each other in a matrix along a plane (Fig. 1); and

an actuator unit (laminated piezoelectric element 38) that is fixed to the passage unit (Fig. 1) to change the volume of the pressure chambers (col. 4, lines 51-58),

wherein the actuator unit includes:

a plurality of piezoelectric elements (piezoelectric ceramic layers 40) that are put in layers and cover the plurality of pressure chambers arranged adjacent to each other in a matrix (Fig. 1),

a plurality of individual electrodes (interior positive electrodes 44) that have been sintered on a surface of one of the piezoelectric elements (col. 4, lines 1-4) and are arranged adjacent to each other in a matrix at positions corresponding to the respective pressure chambers (col. 3, lines 38-41 & Fig. 1), and

one or more sintered members (interior negative electrodes 42 – col. 4, lines 1-4) of the same residual stress characteristics as the individual electrodes (this characteristic is inherent to the disclosure provided in col. 3, line 47—col. 4, line 4 & Figs. 1-3) at positions other than positions corresponding to the pressure chambers (col. 4, lines 36-38) and that are, on the surface of the one of the piezoelectric elements provided with the plurality of individual electrodes arranged adjacent to each other in a matrix (Fig. 1), the sintered members and the individual electrodes having substantially the same residual stress characteristics relative to the piezoelectric elements (col. 3, line 47 – col. 4, line 4 & Figs. 1-3).

Takahashi et al. do not expressly disclose that the actuator unit includes a common electrode that is formed, on a surface of the one of the piezoelectric elements opposite to the surface provided with the individual electrodes, to span the plurality of pressure chambers.

However, Sakaida discloses an actuator unit that includes a common electrode (outer electrode 28) that is formed on a surface of a piezoelectric element (outer piezoelectric ceramic layer 24) opposite to the surface provided with individual electrodes (Fig. 2), to span a plurality of pressure chambers (col. 6, lines 66-67 & Fig. 2). Sakaida teaches that, by utilizing such a common electrode in addition to the inner positive and negative electrodes, the laminated piezoelectric element can synchronously deform in both shear and expansion modes so as to enhance electromechanical transducing efficiency (col. 5, lines 4-14).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize a common electrode, such as that disclosed by Sakaida, into the actuator unit of Takahashi et al.

Regarding claim 23:

Takahashi et al. as modified by Sakaida discloses all the limitations of claim 8, and **Takahashi et al. also disclose** that the sintered members (42) are spaced from an outermost one of the individual electrodes (44a) with respect to two arrangement directions of the individual electrodes (the direction going from right-to-left in Fig. 3, and the direction going from bottom-to-top in Fig. 3).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaida (US 6979077 B2) in view of Takeuchi et al. (US 5512793).

Regarding claim 21:

Sakaida discloses an ink-jet head comprising:

a passage unit (4) in which a plurality of pressure chambers (10) each connected to a corresponding nozzle (Fig. 7A) are arranged adjacent to each other in a matrix along a plane (Fig. 6); and

an actuator unit (21) that is fixed to the passage unit (Fig. 7A) to change the volume of the pressure chambers (col. 11, lines 27-44),

wherein the actuator unit includes:

a plurality of piezoelectric elements (piezoelectric sheets 41-44) that are put in layers and cover the plurality of pressure chambers arranged adjacent to each other in a matrix (Fig. 10), and

a plurality of individual electrodes (35) that have been sintered on a surface of one of the piezoelectric elements (piezoelectric sheet 41 - col. 14, lines 60-64) and are arranged adjacent to each other in a matrix at positions corresponding to the respective pressure chambers (Fig. 6),

the plurality of individual electrodes includes an outermost one of the individual electrodes with respect to two arrangement directions of the plurality of individual electrodes (Fig. 5), and

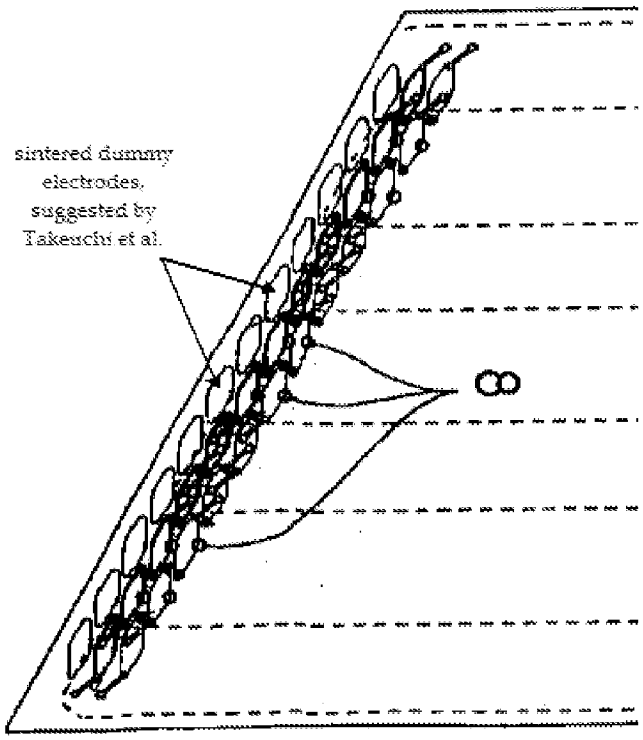
a common electrode (34) that is formed, on a surface of the one of the piezoelectric elements opposite to the surface provided with the individual electrodes, to span the plurality of pressure chambers (Fig. 10).

Sakaida does not expressly disclose that the actuator unit includes a plurality of sintered dummy electrodes at positions other than positions corresponding to each of the plurality of pressure chambers, and that are, on the surface of the one of the plurality of piezoelectric elements, arranged adjacent to each other so as to surround the plurality of individual electrodes arranged adjacent to each other in a matrix, the sintered dummy electrodes and the individual electrodes having substantially the same residual stress characteristics relative to the piezoelectric elements,

wherein the sintered dummy electrodes and the individual electrodes have substantially the same shape and the same size.

However, Takeuchi et al. disclose an ink-jet head comprising a plurality of dummy electrodes (electrodes 76 of displacement adjusting layers 60) of the same residual stress characteristics as individual electrodes (col. 10, lines 2-19) at positions other than positions corresponding to active pressure chambers (Fig. 2), and that are arranged on the surface of a piezoelectric element provided with the plurality of individual electrodes (Fig. 2), wherein the dummy electrodes and the individual electrodes have substantially the same shape and the same size (col. 10, lines 2-19 & Fig. 2). Takeuchi et al. suggest that, by utilizing displacement adjusting layers, the rigidity of the piezoelectric surface will be altered so as to make the amount of deformation of all active pressure chambers more uniform (col. 9, lines 56-63).

Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Sakaida's actuator unit to include sintered dummy electrodes arranged adjacent to each other so as to surround the plurality of individual electrodes (Drawing B below).



Drawing B: This drawing shows the suggested modification of Sakaida's actuator unit, in view of Takeuchi et al.'s teachings, by utilizing displacement adjusting layers in the form of dummy electrodes and dummy pressure chambers (taken from Figure 5 of Sakaida, and modified for clarification of rejection).

Regarding claim 25:

Sakaida as modified by Takeuchi et al. discloses all the limitations of claim 21, and **Takeuchi et al. also suggest** that the sintered dummy electrodes are spaced from the outermost one of the individual electrodes with respect to two arrangement directions of the individual electrodes (Drawing B), and

wherein the two arrangement directions are formed in intersecting planes (Drawing B).

Response to Arguments

Applicant's arguments with respect to claims 1 and 15 have been considered but are moot in view of the new ground(s) of rejection. Please see the above obviousness rejection based on the disclosures provided by Takahashi '439 and Takeuchi et al. '793

Examiner notes that currently amended claim 1 states that one or more dummy electrodes are "spaced from an outermost one of the individual electrodes with respect to two arrangement directions of the plurality of individual electrodes." However, this claim language does not necessarily specify that the dummy electrodes are spaced from the outermost individual electrode in two arrangement directions (such as agreed upon during the interview dated 4/17/2008). Rather this language may simply state that the outermost electrode is the individual electrode that is outermost with respect to two arrangement directions. Examiner notes that the language of claim 5 suggests that the latter interpretation of this limitation is accurate.

Applicant's arguments with respect to claim 8 have been considered but are moot in view of the new ground(s) of rejection. Please see the above obviousness rejection based on the disclosures provided by Takahashi et al. '964 in view of Sakaida '051.

Applicant's arguments with respect to claim 21 have been considered but are moot in view of the new ground(s) of rejection. Please see the above obviousness rejection based on the disclosures provided by Sakaida '077 and Takeuchi et al. '793.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Communication with the USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHELBY FIDLER whose telephone number is (571)272-8455. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Luu can be reached on (571) 272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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